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LIVESTOCK THE BASIS OF AGRICULTURAL PROSPERITY.

JAMES WITHYCOMBE
Department of Animal Husbandry.

Agriculture to be permanently successful must include some form of animal husbandry. It is highly essential that means be provided upon every farm for the replenishment of the fertility of the soil. This is most easily reached by feeding a large proportion of the crude products of the farm to live stock. It makes but little difference what class of stock is fed provided the waste products are properly conserved and returned to the soil. Dairying perhaps affords the quickest means of building up the farm. When butter fat constitutes the only dairy product sold there is practically no soil exhaustion. For example, a ton of butter fat, worth at present market values about $700, takes less than 50 cents' worth of plant food from the farm, while a ton of wheat, oats, alfalfa, or clover hay, worth from $15 to $35, will take from the farm plant food worth about $8 for each ton sold. Thus if the farmer expects to maintain the productivity of his farm he should give careful attention to live stock.

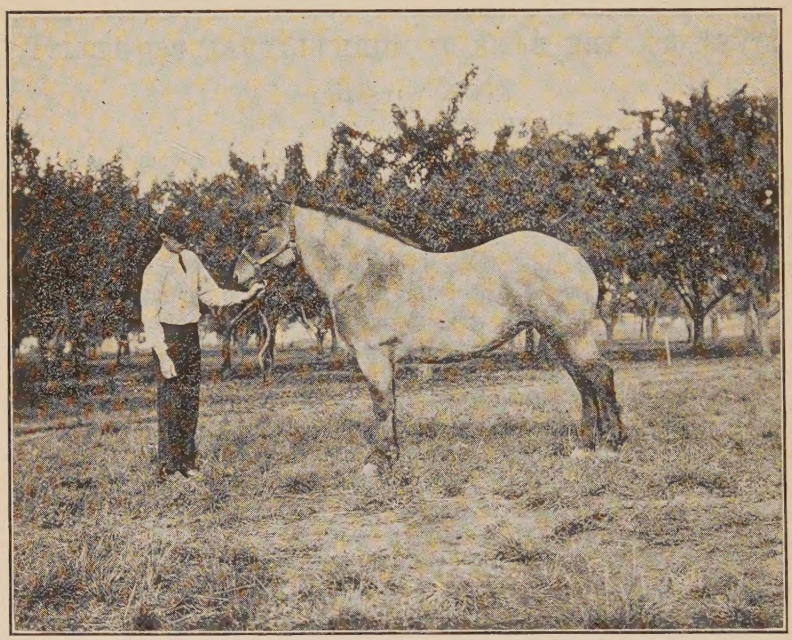
Conditions in practically every section of the State are highly favorable for the production of live stock. In fact since the earliest history of agriculture in Oregon, live stock husbandry has been a prominent feature of the farm. At present the aggregate value of the live stock on the farms of Oregon approximates $65,000,000. The major portion of this stock is found in Eastern Oregon. Agriculture in this part of our commonwealth is undergoing an active transformation. Range husbandry is rapidly giving way to the plow and farm conditions. This is well, but we should not forget the fact that the exclusive growing of the cereals and hay and sending these commodities to market will sooner or later seriously reduce the potentiality of the soil. Thus live stock is practically the only hope for the perpetuity of large crop production.

The field in Oregon's vast inland empire is indeed a favorable one for the development of a very large live stock industry. It matters but little what branch is selected, whether it be horses, cattle, sheep, or swine. This development, however, will be along farm lines rather than range systems, for the latter is steadily becoming restricted until finally it will be practically a system of the past.

DRAFT HORSES IN DEMAND.

At present there is a very active demand for draft horses, in fact buyers are unable to obtain a sufficient number of this class of horses to meet their immediate needs. It is generally conceded that wherever care is exercised in selecting good breeding stock the horses in Eastern Oregon are of a superior quality. The draft horses may not acquire

the size attained by those in a more humid section, but in point of quality they are generally superior. Horses in this section are noted for their good feed, clean limbs, and great power of endurance. They are as a rule remarkably free from the ordinary blemishes, such as ringbones, spavines, sidebones, and other common forms of unsoundness.



YORA. Belgian mare, 3 years old, owned by the Oregon Agricultural College. Yora was first in her class at Oregon State Fair, Portland Country Club, and Alaska-Yukon Exposition, Seattle, 1909.

HORSES OF LIGHTER WEIGHT ALSO IN DEMAND.

It is predicted by those who are in close touch with the situation that there will be a good demand for horses weighing from 1250 to 1500 pounds of the right stamp. There is a rapidly growing scarcity of this class of horses. The popular horse of this size, however, is one that is well balanced, with good style and action, clean limbed, and stoutly built.

Every farmer in the great inland empire of our State should grow some horses. The sales of surplus horses should be made an important source of revenue to the farmers of Eastern Oregon.

THE PRODUCTION OF BEEF.

Beef from the ranges is soon going to be a thing of the past. We must look to the farm in the future for our beef production. Systems of marketing are also undergoing active changes. Instead of sending our surplus cattle to the corn-growing states to be finished for the market, the home demand is such that local consumption will soon absorb the total product of the northwest. Our local market

is growing steadily more discriminating as to quality. Thus the farmer in order to obtain top prices for his beef must send them to market in a more highly finished form. This can scarcely be reached by hay alone. A small supplementary feed of grain should be given. For this perhaps barley will prove to be the best. Not only will a small feed of grain with good hay greatly improve the quality of the beef, it will also be found economical. It has been shown by actual experiment that a small supplemental feed of grain has made a considerable saving in hay required for a given gain. At the present high values of hay this is an item of some import. Alfalfa, clover, or peas and grain hay will prove to be by far the best roughage for fattening cattle in Eastern Oregon. Either one of these hays with a small supplemental feed of barley will produce a high-class beef. It is important also to fatten the cattle at an earlier age than it has been the practice in the past. The three and four year old steer is no longer popular. Younger beef is demanded. This also is favorable to the producer, as the younger the animal the greater the gains made for food consumed. A thrifty yearling steer will make a pound gain from 25 to 50 per cent less feed than is required to secure a pound gain in a matured steer.

SHEEP ON THE GRAIN FARMS OF EASTERN OREGON.

Sheep are an exception to changing range conditions. They will undoubtedly be produced more or less upon the range indefinitely. There are large areas of rough, untillable land in Eastern Oregon that will always be utilized for sheep husbandry. Thus the supply of range sheep will always be large in this section. The changed conditions, however, will be in the manner of marketing. Instead of shipping train-loads of stock and half-fatted sheep to the middle states, they will be finished on the grain farms of Eastern Oregon and marketed at home. There is an immense field for development along this line. Instead of the great area of bare-fallowed land burning out organic matter and unnecessarily wasting valuable food elements of the soil, peas, alfalfa, and other forage crops will be grown and utilized in fattening sheep. The hoof of the sheep would certainly be golden upon these farms. There is no reason why train-loads of the very best mutton cannot be annually produced upon the wheat farms of the Columbia River basin.

Wherever wheat can be successfully grown the field pea can certainly be successfully produced. There is no better feed than this to fatten sheep and at the same time the growing of this crop will greatly improve the fertility of the soil. This crop should be sown as early as possible in the spring, putting on about two bushels of seed per acre. When the peas are well developed in the pod and the vines still green they should be cut and cured for hay.

It may not be feasible for the grain farmer to raise his own sheep, thus perhaps the better plan would be to purchase the sheep in the fall from the range and run them on the stubble for awhile and then put them on the pea hay. This should be fed in a manner to prevent waste and at the same time convenient for feeding. Where there is no mud this is probably best accomplished by feeding on the ground through a board fence with a space between the two lower boards to permit the sheep to put their heads through. Fattening sheep must be kept out of the mud or else poor results will be secured.

In feeding alfalfa or clover hay a small grain ration should be fed. Good water must be supplied in abundance and convenient of access.

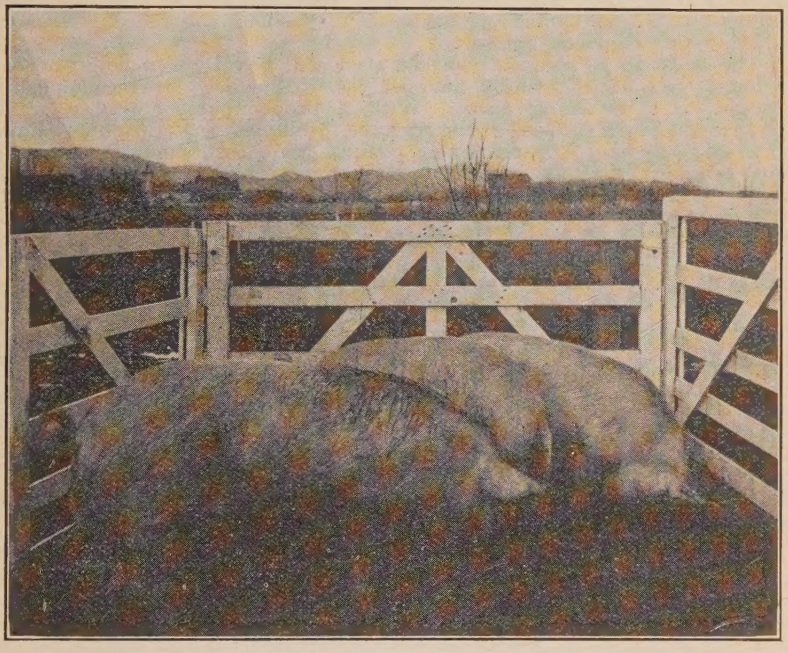
There should be no difficulty in working out good systems for fattening sheep upon any of the grain farms. This branch of animal husbandry should not only be immediately profitable to the farmer but at the same time insure the perpetuity of profitable wheat production.

Cotswold ewes owned by the Oregon Agricultural College. These ewes were wintered on clover silage, clover hay, and one pound of oats for each ewe daily. Average weight at close of experiment, 255 pounds.

THE HOG, THE GREAT HOME-BUILDER.

There is probably no animal upon the American farm the profits from which have paid off more mortgages, built more homes, fed, clothed, and schooled more children than has the hog. The hog is the most cosmopolitan animal on the farm. His habits of feeding have a wider range than those of any other farm animal. Thus swine are especially well adapted to the varying conditions of the farm.

The wheat farms of Eastern Oregon should be as famous for their production of hogs as they are for the production of wheat. Here again the field pea can be used to great advantage. It is estimated that from $20 to $30 per acre can be secured from field peas when



Yorkshire swine owned by the Oregon Agricultural College. These hogs were wintered on kale with a small supplementary feed of grain.

grazed off by hogs. Many profitable systems of hog production can be worked out on the grain farms of Eastern Oregon. Some farmers have made good success by pasturing hogs on fall or spring sown grain during the summer, then running them on the stubble until this is thoroughly gleaned, and feeding them for a short period on grain. In this way an excellent class of hogs is economically produced.

Perhaps the most difficult problem in the strictly wheat-growing section is the winter maintenance of the breeding stock. It is too expensive to winter them solely on high-priced grain. This may be overcome by feeding pea or alfalfa hay with a small supplementary feed of grain. In this way an unlimited number of breeding stock can be carried inexpensively through the winter. Where roots are successfully grown these may be fed instead of the hay.

The same principle holds good with hogs as with other farm animals, viz., that the younger the animal the greater the gain for food consumed. This would indicate that the pig should be fattened for the market at the earliest possible age. Pigs should be farrowed early in the spring and allowed to run with their dams upon alfalfa, clover, or grain pasture. In addition to the pasture they should receive a small supplementary feed of grain. If a young pig be compelled to subsist upon pasture he is very liable to become what is generally understood as "pot-bellied," which is an unthrifty form. The aim should be to keep the pig in a thrifty growing condition until he is fattened in the fall. It does not usually pay so well to carry pigs through the winter as it does to fatten spring pigs in the fall. If peas are grown the hogs may be turned on them when the pea begins to harden, or they may be left until thoroughly ripe. If the peas fail to put a good finish on the hogs they should be fed for a short period upon wheat or barley.

The question is frequently asked if it will pay to feed dollar wheat to hogs. We unhesitatingly answer, yes, if the hogs are economically brought to a fattening stage. With a proper pasture and a small supplemental grain feed a hog can be brought to a fattening stage at a cost of about 3½ cents per pound. This cost should not exceed four cents at the very outside. Numerous feeding experiments conducted at the Oregon Experiment Station have shown conclusively that it requires approximately 4½ pounds of either wheat or barley to produce one pound gain of live weight for a fattening period of about 60 days. Estimating then that a pig weighing 150 pounds has cost $6 he is fed 450 pounds of wheat or barley and weighs 250 pounds. The hog is then worth say 6½ cents per pound, or $16.25. Thus the 450 pounds of grain fed gave a return of $10.25, or in other words gave a return of $1.36 a bushel for wheat, or $1.13 a bushel for the barley fed. If present prices of pork are taken in consideration the returns from grain fed would be much higher. There is no doubt but what swine husbandry can be made very profitable upon the grain farms of Eastern Oregon. This section should no longer passively observe train-loads of hogs passing their farms from corn-growing states, thus draining our State of much money; but should endeavor to develop the industry until Oregon shall be known as one of the greatest swine-producing states of the Union.

TILLAGE AND CROPPING METHODS FOR THE EASTERN OREGON DRY-FARMER.

H. D. SCUDDER
Department of Agronomy.

The economic and agricultural development of the Eastern Oregon dry farming area is at a critical stage. The scanty population of this fertile country, and the large land area still undeveloped—combined with the large size of the farms, the low yield per acre, the lack of live stock, and the depletion of the soil through continuous grain cropping, in the area now farmed—all these factors demand immediate attention, adjustment, or remedy if the future agricultural development and economic prosperity of the region is to be such as is justified by the known possibilities of soil and climate.

Briefly stated, Eastern Oregon now has much less than one-half of its possible farm area under the plow; the area plowed is returning only about half of what it is capable; the size of farms is more than

double what is desirable, and the population is less than one-tenth of what the country is capable of supporting.

Smaller farms, more people, and an accompanying higher production per acre are not possible under the present general methods of farming used. The extensive form of farming has now reached its highest development and its destructive effect upon fertility is apparent to the discriminating eye, in the increasing foulness of the land with weeds; the rapid decrease in the *humus content* of the soil; the growing tendency of the soil toward blowing, and the increased labor required to get the seed bed back into condition again after each additional cropping.

The more intensive and diversified farming that must be brought about in the area now farmed, as well as the later development of new areas of more extreme climatic and soil conditions—are alike dependent primarily upon the use of more thorough tillage methods, and the introduction of such crop rotations as will restore and maintain fertility.

SUCCESSFUL THOROUGH TILLAGE METHODS.

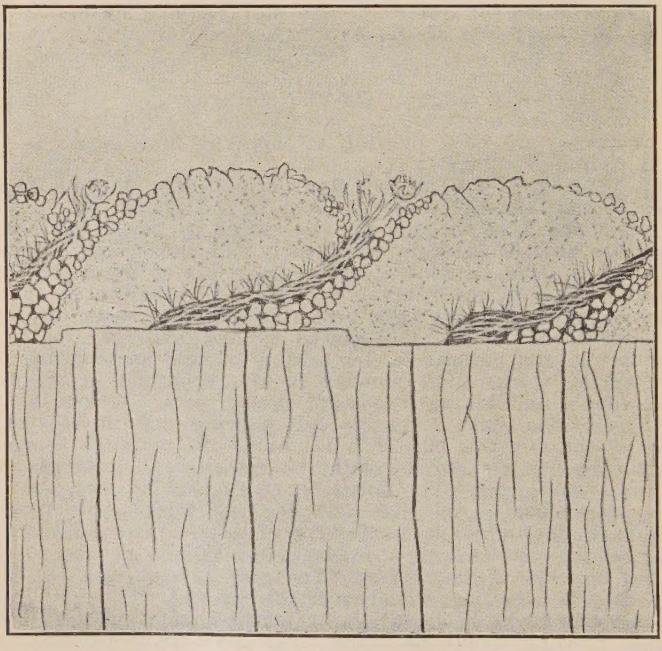
The highest production in Eastern Oregon is dependent first and foremost upon the fullest possible utilization of the precipitation. Fully one-half of the total annual precipitation may be conserved for crop use by means of thorough tillage operations. This amount is ample for much higher production than is now being obtained. Probably not more than one-fourth of the total precipitation is now used for crop production.

Deep plowing is the first essential in moisture-conserving tillage. It not only increases the absorbing and storage capacity of the soil, but prevents the formation of the hard-pan often resulting from the plow pressure and higher evaporation from continued shallow plowing. Much of the rainfall is lost because it never gets to the deeper soil, which is the dry farmer's reservoir for the storage water that supplies the crops through the dry season. Variation in the depth of the plowing with an occasional deep plowing of eight or nine inches is the first step in thorough tillage.

Fall plowing is the second step—it not only permits plowing to greater depths than can safely be done in the spring, but it leaves the land rough and loose through the wet season so that it holds the snow and quickly absorbs the rainfall of early fall and spring. Leaving the land in the stubble all winter causes great loss of the rainfall through evaporation, due to the running together and crusting of the surface soil which prevents the water entering the soil reservoir, and also causes surface-washing. Fall-plowed ground may be worked earlier in the spring, and permits earlier seeding as well as lessening the rush of the spring work. Fall plowing is also beneficial in making plant food available and killing weed and insect pests. Where the lateness of the fall rains make extensive fall plowing difficult because of the dryness of the soil, this may be offset under the thorough tillage system by double-discing the stubble with the disc harrow, immediately after the grain is harvested. The difficulty in dry plowing may also be offset by the proper use of the disc plow for fall work. Disc plowing has not been found highly successful the country over, and is ordinarily considered the poor farmer's method, but this is not because of the plow but because of the farmer. The poor farmer uses the disc plow because it gets over the ground more rapidly and with less horse power —in other words, he is doing a poor job of shallow plowing. Properly used disc plowing should be deeper than mold-board plowing (eight to nine inches), more horse power should be used, and the plow should be kept moving faster, so that the soil is more thoroughly pulverized and the stubble better covered. Disc plowing is easier when done on

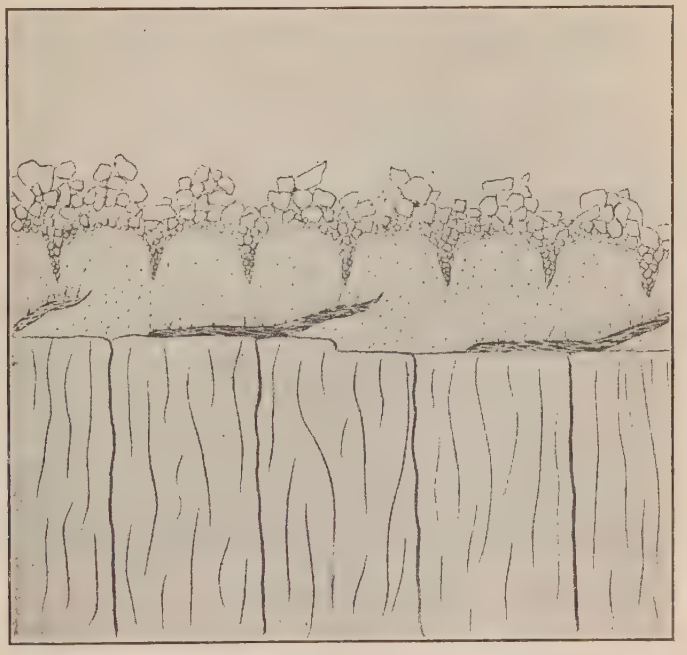
land previously spring plowed and then double disced immediately after the harvest, particularly where the stubble is heavy. By always fall-plowing half of the land and spring-plowing the other half, and then using the disc plow on the land previously spring-plowed, and with the additional precautions stated above, the work of this machine has not been found inferior. It has the one advantage of permitting fall plowing in a dry soil on an extensive scale. Unless the conditions named are observed, however, the disc plowing is not recommended.

Where the land cannot be plowed in the fall it should at least be double-disced with the disc harrow. Double-discing should always be done by lapping half the first round—never by discing crosswise. This disc harrowing has many of the same benefits as fall plowing and in addition it makes spring plowing much easier as it prevents the running together and packing of the soil during the winter. It also aids in the decay of the stubble, causes the weed seed to germinate early in the spring and makes spring plowing more effective by causing a more perfect union of the plowed land with the ground underneath so that the storage water in the soil reservoir is more readily brought into the root area during the dry season. The disc harrowing should preferably be done immediately after the harvest. At this time it gets the weeds that appear after the grain is taken off and catches and holds the moisture from the early fall rains. No more important practice for the dry farmer can be urged than this one. Such a machine as the double-action cutaway disc harrow is especially good for this work.



Soil after plowing, showing exposed surface of furrow slice, and clods, trash, and air space underneath. (After Campbell.)

Where the land goes through the winter in the stubble and the plowing is done in the spring it is of the greatest importance that it be preceded by double discing very early in the season. This early double-discing will bring up the weeds, will help conserve early spring rains, break down the stubble and make the spring plowing very much easier and more effective, in just the same way as does the fall discing. To make a better union between the plowed land and the land underneath is more important in the spring, however, than in the fall, as the soil has no time to settle into place at this season. On this account also, sub-surface packing is of the greatest value on spring-plowed land. Such packing smashes the clods underneath the furrow, fines the surface soil, and compresses the dry stubble and trash turned under, thus preventing the rapid drying out of the plowed land and eliminating the air spaces under the furrow which shut off the rise of storage water from the lower depths of the soil. Spring plowing should always be followed immediately by the smoothing harrow in order to prevent rapid loss of moisture from the loose, newly turned land.



Soil after using packer, showing surface mulch and compression under the furrow slice. (After Campbell.)

After correct plowing methods the chief end sought in the thorough tillage system relates to moisture conservation through summer cultivation, not only in the summer fallow, but of row crops as well. The object of summer cultivation is not only to rid the fields of weeds, which are enormous feeders upon moisture and plant foods, but above everything else to maintain a loose, dry soil mulch, to prevent loss of moisture through evaporation. Summer cultivation should be shallow, each cultivation varying slightly in depth, all the way from two to four inches.

These cultivations as a rule should follow rains that have compacted the surface, so as to break up the crust formed. Care should be used not to keep the soil too fine, particularly where blowing is bad. A mulch of small clods is superior to a dust mulch and hence cultivation should be given immediately after heavy rains when the soil is still moist enough to clod slightly, but not wet enough to puddle. A mulch of this character is more effective and will not blow, nor will it run together and pack as readily under heavy rains. Where soil-blowing is the difficulty, other preventative measures are: Cultivation of some sort crosswise of prevailing winds, preferably with a machine like the disc harrow that leaves the ground slightly ridged; the planting of a few rows of corn, or other heavy forage crop, at intervals of a thousand yards or so, cross-wise of prevailing winds; the use of a few loads of straw or manure where blow-outs are just starting at certain points. The basic means of preventing blowing is through the increase of the *humus content* of the soil. The decayed organic matter coming from the use of a proper crop rotation furnishes the fiber and cement which binds the soil particles together into small masses or kernels, thus preventing blowing. Continued wheat cropping has steadily reduced the *humus content*, so that blowing is becoming worse and a good mulch is much harder to form.

WATCH YOUR NEIGHBORS. Thorough Summer Tillage versus Weedy "Summer Fallow." (Montana Experiment Station.)

For soil-mulching, the smoothing harrow alone is not sufficient as it does not work deep enough and tends to make the mulch too fine. The disc harrow, as well as the Acme harrow, should be used occasionally in alternation with the spike-tooth harrow. The spring tooth weeder has proved an excellent machine for rapid cultivation during the early stages of growth, both on row crops and broadcasted crops. For row crops the chief surface tillage implement is the riding two-row cultivator of either the knife or small shovel type. With this machine, shallow, flat cultivation is the object.

Thorough summer tillage of the summer fallow land will increase the yield for two years following. By this means, in many parts of Eastern Oregon, two crops may be raised in three years and "summer

fallowing" with thorough tillage once in three years may take the place of "summer fallowing" every other year.

The cost of such thorough tillage, far from being prohibitive, is, on the contrary, inviting, when compared with the probable return. At the outside, such thorough tillage would require but three extra discings and four extra harrowings, at a total cost of about $1.50 per acre, resulting in some cases on record in an increase of ten bushels of wheat per acre the first year following the summer fallow, and an extra crop of some spring-sown grain or forage the second year after the summer fallowing.

On this basis a tillage program for the three years would be somewhat as follows:

First year—Double discing after harvest. Fall plowing. Double discing in early spring. Harrowing two or three weeks later. Harrowing after the next heavy rainfall. Harrowing in June. Discing in July. Harrowing in August. Acme harrowing in September.

Second year—Press drilling wheat in fall after first rain, but not later than the first of October. Harrowing wheat in spring.

Third year—Double discing after harvest. Double discing early the next spring. Harrowing in two weeks. Harrowing before seeding. Press drilling barley, or emmer, or field peas, or corn, or kaffir corn in rows. Harrowing young crop with weeder and cultivating row crops later.

The use of a press attachment with the drill is a necessary accompaniment of the thorough tillage system. By firming the soil directly over the seed it aids in causing a vigorous germination and deep rooting, particularly in a dry seed bed or with small seeds. The double press wheel is even better than the single. Where the press wheel attachment is used the type of furrow opener is less important.

The harrowing of winter grain in the spring to break the crust formed through the winter is a point not to be overlooked. Two, or even three harrowings, are often beneficial. The crust formed over winter is not only broken but a thick stand is often advisedly thinned by such harrowing and, on the other hand, a thin stand may often be thickened through the better stooling caused by breaking the crust.

CROPS FOR THE DRY FARMER.

With more thorough tillage methods a greater variety of profitable crops may be added to the Eastern Oregon dry farmer's list of money makers.

Cereals—Wheat will always be the chief crop of this area, but much remains to be done in increasing its production through more thorough tillage; through soil-building rotations, and through the use of better varieties and purer seed. In any dry farming territory winter varieties have the advantage in yield. The Turkey Red wheat, because of its beards and shorter straw, and because of the poor quality of the seed used so far, has as yet not gained great favor in Eastern Oregon. From the success that Turkey Red has found in every other dry farming territory it is believed that it will eventually prove the leader in this region, but it will be necessary to become familiar with its peculiarities and to get purer and hardier seed, grown at high elevations, such as that produced in Montana. Among spring varieties of wheat the Durum or Macoroni type, such as the Yubanka, is finding increasing favor because of its great drouth resistance. Both Turkey Red and the Durum rank high with the millers when once they have become established on the market.

Barley—the highest yielder of the grains and of especial value as a fattening feed—should be more widely grown for this purpose. The Manshury is the most promising of the spring varieties for high yield,

and the Hulless for early maturing. The development of winter barleys is to be encouraged.

Emmer, because of its greater drouth resistance, makes an excellent substitute in the dryer sections for oats as a barn feed. This grain is generally spring sown, but the black emmer is showing promise of success for fall sowing.

In oat varieties the Kherson, Sixty Day, and Black American have been most successful in the dry farming states.

Thin seeding of the grains has much to do with successful yields under dry-farming conditions. The most successful rates are: Wheat,

WHAT OUR NEIGHBORS IN MONTANA ARE DOING. Turkey Red fall wheat without irrigation. Yield 58 bushels per acre. (Montana Experiment Station.)

three pecks; Durum wheat, five pecks; barley, six pecks; Hulless barley, four pecks; oats, six pecks; emmer, six pecks.

Corn is one of the best of the dry farming cereals. It uses relatively little moisture and permits cultivation which conserves moisture and destroys weeds. On account of the cold nights the hardier, early-maturing varieties must be used.

CORN-GROWING IN EASTERN OREGON.

Field corn thoroughly cultivated may profitably replace, every third year at least, the bare summer fallow in Eastern Oregon. Corn may be grown either for grain, fodder, or silage. Minnesota No. 23, a dent variety, is believed to be the best yet found for Eastern Oregon conditions.

The grain stubble should be double-disced immediately after the harvest and then deeply plowed in the fall. Early in the spring it should be thoroughly disced and harrowed frequently before planting time to conserve the moisture and kill the weeds. Where spring plowed, the land should be double-disced early—then plowed and packed or rolled.

The corn should be planted from May 1st to 15th in rows three feet apart at the rate of one grain every 18 inches. Planting may be done preferably with a lister or with a grain drill, or by replowing the ground shallowly in the spring and dropping three grains to a hill three feet apart in every third furrow and following the plowing with a harrow. For fodder or silage the grain may be planted more thickly in the row, a kernel every nine inches, using a grain drill with part of the holes stopped up, or the lister or one-horse drill.

The success of the corn crop depends very largely upon the thoroughness of cultivation. The first two cultivations may be given with the spring-tooth weeder of the Hallock type, or with the common smoothing harrow. As the corn gets higher either a knife or six-shovel cultivator should be used and the crops should receive at least three shallow cultivations with this machine before it is laid by.

The corn field should be disced and fall-plowed after the crop is taken off.

Forage Crops—Under the more intensive farming system the production of forage for live stock feeding is a primary requisite. At present the grain hays are most commonly used and these, as a rule, are cut too ripe. Their highest nutritive value is obtained when cut in the soft dough stage. A large number of other crops may be better used for this purpose, however. The value of corn for fodder, green feed, or silage, has already been suggested. The drouth-resistant kaffir corn drilled in about May 15th, four pecks per acre, either broadcast or in rows and cultivated, is also a high yielding forage. Fall-sown rye makes excellent spring pasture for early green feed. Artichokes have proved an unusually good hog pasture. Thousand-headed kale started early in cold frames and then transplanted and thoroughly cultivated makes a good summer green feed for cows. Cow squash may also be successfully grown. Broom-corn millet has shown value as a hay crop in the dryest seasons.

For permanent pasture or hay, some of the hardier grasses sown in the early spring on a shallow, well packed and finely pulverized soil previously summer fallowed, have made excellent successes. Smooth brome grass alone, 20 pounds per acre, or a mixture of brome grass twelve pounds and alfalfa six pounds, or of six pounds each of smooth brome, meadow fescue, tall meadow oat grass, and alfalfa, is recommended. Samples of grass seed should be sent to the Experiment Station for purity and germination tests before sowing.

The most important additions to the forage crop list of Eastern Oregon, however, are the alfalfa and field peas, not only because of their high feeding value but because of the great necessity for them in rotations for restoring the fertility that the cereals so rapidly consume. These two crops, through their nitrogen-gathering faculty, enrich the soil both chemically and physically because of the high nitrogen humus they leave in it. In addition to this they form a substitute for the summer fallow in that they make use of moisture not available to other crops—alfalfa through its deep-rooting system, and field peas through their maturing so early as to permit summer tillage after they are harvested. Both crops may also be grown in rows and cultivated, thus conserving moisture and, where harvested for seed, producing an unsurpassed money crop.

GROWING FIELD PEAS IN EASTERN OREGON.

Over the larger part of the dry farming area of Eastern Oregon the field pea crop may be profitably substituted for the bare summer fallow. Field peas restore the nitrogen and humus depleted through continuous wheat farming and make a most valuable hay, a splendid hog and sheep fattener, or a highly profitable seed crop.

The grain stubble should be double-disced immediately after the harvest and deeply plowed, preferably in the fall, and left rough-plowed over the winter. At the earliest possible date in the spring the fall-plowed ground should be disced and worked down and at once seeded to the field peas at the rate of two bushels per acre, press-drilled to a depth of three inches with any grain drill that will not split the peas. Where spring-plowed, double-discing should first be done, then plowing, followed with the sub-surface packer or corrugated roller. The peas should be cut for hay with the mower (advantageously with a pea-harvester attachment) when the first peas on the vine ripen.

For hog fattening turn in the hogs when the peas begin to get too hard for table use.

For seed, cut when the bulk of the pods are ripe, and thresh with a bar concave with most of the spikes removed and cylinder run at low speed to avoid splitting. For seed production the peas may also be grown in double-drill rows 2½ feet apart and cultivated.

Peas may also be cut green as a soiling crop for cows.

It is very important that the pea field be thoroughly disced as soon as the pea crop is off the ground, summer tilled, and then fall plowed.

ALFALFA IN EASTERN OREGON.

Grown for seed production, alfalfa is destined to become one of the greatest money-makers of the Eastern Oregon dry farming belt. It is also a great hay, pasture, and soiling crop and is unexcelled as a restorer of soil fertility.

Alfalfa grown in cultivated rows for seed production. Western Kansas. (United States Department of Agriculture.)

The common variety of seed should be used, preferably dry-land grown in Eastern Oregon, Montana, Utah, or Kansas.

Good clean wheat land with a deep soil that has been in well-cultivated summer fallow should be selected. This land should be double-disced, then deeply plowed in the fall and left rough over winter. Where spring plowing is done it should be very early and more shallow, and should be preceded by double-discing, then plowed and thoroughly

firmed with a sub-surface packer or corrugated roller. In either case thorough cultivation and frequent harrowings should be given till seeding time, to conserve moisture, kill weeds, and prepare a finely pulverized seed bed.

Seeding should be done from April 1st to 15th at the rate of ten pounds per acre of good seed, put in with a press-drill to a depth of about two inches, then rolled and lightly harrowed. No nurse crop should be used and it is of vital importance that the seed be tested for purity and germination.

The crop should be clipped several times the first year with the cutter bar set high, to keep down weeds and induce root growth, and the clippings left on the ground as a mulch unless very heavy. It should be lightly harrowed after clipping. Stock should not be turned on the field the first year. The second year, and thereafter, cultivation should be given every spring with the disc harrow set straight, followed by the smoothing harrow. Alfalfa should be cut for hay when beginning to come into bloom.

For seed production alfalfa should be press-drilled in double rows, 2½ feet apart, on ground prepared as outlined above. The ordinary grain drill may be used by stopping up part of the holes and setting the grass-seeder attachment to sow at the rate of 24 pounds. This will deposit about eight pounds of seed per acre in double-drill rows, 2½ feet apart. The second year this stand may be thinned by cross harrowing or other means so as to leave about one plant to every eight inches. Where soil-blowing is bad the rows should be drilled crosswise of the prevailing wind and possibly a row of barley drilled in between the rows of alfalfa. With the first cultivation the barley will be taken out. Thorough cultivation should be given the alfalfa rows with a regular two-row cultivator, leaving the soil surface as flat as possible. The first crop should be harvested for seed. Where the first crop makes too much stem growth for good seed production it may be set back by an early clipping when the growth is about six inches high.

With this list of crops to draw upon, all the essentials of a good rotation may be obtained—cultivated crops to conserve moisture and destroy weeds, legumes to store atmospheric nitrogen and humus in the soil, grasses and manures to increase its *humus content* and moisture-holding capacity. Summer fallowing need be done only where the rainfall is so scanty as to make it necessary to conserve moisture and grow grain crops in this expensive way. Thus may more intensive farming be brought about with smaller farms, more economical distribution of labor through the year and a steadier annual income since live stock and seed products may be added to the grain, as money crops.

SOIL FERTILITY.

By C. E. Bradley
Department of Chemistry.

It is a well established fact that certain chemical elements are essential to all forms of plant growth. Experiments have shown that these elements are obtained by plants in part from the air and in part from the soil. The whole fertilizer industry owes its existence to the fact that a few of these soil elements, in the form of soluble compounds, have been found to be valuable for stimulating or reinforcing unproductive soils whereby increased crop yields are obtained. In other words, some soils are deficient in these essential plant foods either by nature or through artificial causes.

The agricultural chemist when examining a soil in order to determine means for improving its productiveness will therefore measure the nitrogen, potassium, phosphorus, and lime which it contains as good stocks of these plant foods have been found essential to a productive soil. The soil's organic matter or humus will also be measured, because the bacterial action, through the agency of which the plant obtains its food, is centered in this organic matter and the required granular structure and moisture-holding capacity characteristic of the soil in good physical condition is also dependent on organic fiber—hence the necessity of a good supply of humus.

In measuring the plant food in a soil three methods are used by chemists; one gives the "total" plant food, or the entire amounts present in the soil, another the "acid soluble" food, or that portion soluble in strong acid, which represents all the plant food that would become available for the plants' use for years to come, and lastly attempts are also made to measure the "immediately available" food by extracting soils with weak acids which approximate in strength the plant root secretions. Both the "total" and "acid soluble" plant foods can be measured with great accuracy, but the "immediately available" food can only be approximately determined.

In table I the results obtained from an analysis of the Eastern Oregon silt loam collected at Cecil are given, showing the relative proportions of total, acid soluble, and available plant food as found in this soil.

TABLE I.

Comparison Eastern Oregon silt loam.

	Total per cent	Acid soluble per cent	Available per cent
Nitrogen	.12		
Potash	1.63	.74	.10
Phosphoric acid	.30	.21	.13
Lime	4.52	3.05	

In the column marked "total" in the above table we find abundant supplies of potash, phosphoric acid, and lime, and by referring to the "acid soluble" column we see that comparatively large proportions of these mineral foods are soluble in strong acids, which indicates that they are or will be by natural weathering processes, rendered available for the plant's use. With regard to the available potash and phosphoric acid in this soil, while the percentages noted are comparatively small, we find that on calculating to the acre-foot these percentages represent 3500 pounds of potash and 4400 pounds of phosphoric acid—amounts largely in excess of those required to satisfy any single crop. We would conclude, therefore, that this Eastern Oregon silt loam is well supplied with the mineral foods, potassium, phosphorus, and lime in readily available forms. With reference to the nitrogen supply we find the semi-arid soils in general are characteristically lower than the soils of the humid regions. The Cecil silt loam contains .12 per cent and the Eastern Oregon wheat soils in general run from .10 to .13 per cent nitrogen, approximately one-half the amount found in the valley soils of Western Oregon. While this cannot be considered a deficiency it would indicate that conservation of the nitrogen of these soils is important.

A very interesting series of analyses has been made by the Station Chemical Department in which a number of virgin and the corresponding fallowed soils have been carefully studied to determine changes which have taken place in these soils during the process of cultivation.

The samples were collected in Sherman, Morrow, and Umatilla counties, and were chosen as representative of the oldest farmed soils in these sections, the original virgin soil being also collected for comparison. These soils have been in cultivation for from 17 to 30 years. In the investigation the supply of nitrogen and organic matter was determined, the "organic carbon" in the table being an exact measure of the organic matter in the soil.

TABLE II.

Comparison of nitrogen and organic matter in virgin and fallowed soils in Eastern Oregon.

No.	Description	Total nitrogen per cent	Decrease nitrogen per cent	Organic carbon per cent	Decrease organic carbon per cent
1	Virgin, surface	.114		1.527	
2	Fallow, surface	.107	—6.1	1.173	23.2
3	Virgin, subsoil	.081		.986	
4	Fallow, subsoil	.081	—0.0	.754	23.5
5	Virgin, surface	.101		1.413	
6	Fallow, surface	.102	+1.0	1.115	21.1
7	Virgin, subsoil	.094		.973	
8	Fallow, subsoil	.090	—4.3	.735	24.4
9	Virgin, surface	.098			
10	Fallow, surface	.102	+3.9		

A study of table II reveals the interesting fact that there is on the average practically no loss of nitrogen from the fallowed soils, a small loss being noted in some cases, in others a slight gain. With an average yield of 20 bushels of wheat approximately 30 to 40 pounds of nitrogen would be removed by grain alone from each acre. As little or no waste by leaching occurs, it would seem that fixation of nitrogen has taken place to the extent of maintaining practically a nitrogen equilibrium. In support of this it may be said that these soils are warm, porous, and mildly alkaline with lime carbonate, and when sufficient moisture is present would furnish a good medium for bacterial growth.

Referring to the organic matter of these soils, however, we see that marked changes have taken place in the fallowed soils, each sample showing a loss of from 21 to 24 per cent of its original organic matter. In other words, nearly one-fourth of the original humus in these soils has been lost by oxidation or burning out in the fallowing process. Since humus is absolutely essential to a productive soil it is readily seen that some system of farming must be adopted on these soils that will maintain or increase their humus supply if they be kept productive.

Regarding the mineral foods, potash, phosphoric acid, and lime, we are not able to detect their losses from a soil under cultivation as the stock of these foods is large and the amounts removed by the comparatively few years of cropping, to which our soils have been subjected, are not measurable. With reference to nitrogen and humus, however, we find that under Western Oregon conditions, wheating without rotation and clean cultivation, as in orchard practice, result in large losses of both of these soil essentials. Our investigations indicate that in Eastern Oregon under conditions of light rainfall, the soil nitrogen is not lost so rapidly but that the loss of humus is heavy in the summer fallow system. In Western Oregon the supply of nitrogen and humus is maintained by the growth of vetch and clover in rotation, and it would seem that the loss of humus which results from the fallow system in Eastern Oregon must be met likewise by some rotation adapted to this region.

THE HOME ORCHARD IN EASTERN OREGON.

C. I. Lewis
Department of Horticulture.

The farmers in Eastern Oregon should give more attention to the home orchard. In many cases they are somewhat isolated from commercial districts, thus making it hard at times to procure family supplies of good fruit. Nothing would tend to increase the home comfort, the enjoyment and health of the family more than a well selected family orchard.

LOCATION OF FAMILY ORCHARD.

It is an advantage where possible to locate the orchard near the farm buildings. There would be cases, however, where this would be impracticable as the buildings are often located in spots that would tend to be frosty in spring. Where possible choose a location that has the best of air drainage and where the cold air does not settle. In a few cases the orchard can be located close to buildings in order to protect it from bleak winds. In selecting the home orchard the average man chooses one altogether too large, and he soon finds himself loaded down with an orchard that produces much more fruit than he has use for, and demands more time and care than he is willing to give. In a few years the chances are that his orchard becomes badly neglected. An orchard consisting of from six to twelve apple trees, three or four pear trees, and a couple of prune or plum trees, four cherry trees and a small fruit patch 20 by 50 feet should easily supply the fruit necessary. This does not cut down the number of varieties one can grow, for it is an easy matter to bud or graft a number of varieties on a single tree.

PREPARATION OF THE GROUND.

Give the ground good, deep, thorough preparation and supply it with an abundance of humus and plant food by plowing in crops of vetch or pears or else a good supply of well-rotted barnyard compost, only the well-rotted should be secured. We find that fresh straw and other coarse undecayed materials may do the ground more harm than good for in a dry soil it decays very slowly.

TIME OF PLANTING.

In Eastern Oregon there is practically only one safe time in the year for planting, and that is in the spring. There are, of course, sections in which fall planting would be successful, but where severe temperature considerably below zero is realized and where the ground is bare it is very hard on young trees. Give the trees plenty of room to develop. Try to encourage a broad-spreading tree rather than a tall, spindling one. In this way an orchard can be cared for with less amount of work. Plant apple trees 30 feet apart, pears 20 to 25 feet, sweet cherries 30 feet, sour cherries, 15 to 20 feet, and peaches and prunes 15 or 20 feet.

VARIETIES.

It is a somewhat difficult matter in a short article to dwell on the best varieties. When one realizes that we have a range of elevation from 350 to 4500 feet, the range in rainfall from as low as two or three inches up to twenty, also a half dozen different types of soil, one

easily sees that the problem becomes complex. In choosing varieties for the home orchard we are not always striving to attain the highest commercial grade. In the family orchard, quality is one of the principal points to consider, and an abundance of fruit the year round is a second consideration. In order to get the latter we are often obliged to introduce some varieties that are lacking in quality for eating purposes.

For the lower altitudes of Wasco, Moro, Crook, Gilliam, Sherman, and Umatilla counties the selection can be made from the following varieties:

Apples—Yellow Transparent, Gravenstein, Jonathan, Winesap, Rome Beauty, Wagener, and Ben Davis. The latter for spring use.
Pears—Practically any commercial variety, including Bartlett, Clapps Favorite, Seckel, Anjou, Winter Nellis.
Cherries—Lambert, Royal Anne, and Bing for sweet cherries. Sour cherries—Early Richmond, English Morello, and Olivet.
Prunes and plums—Use any of the standard varieties, such as Italian, Hungarian, and Peach Plum.
Peaches—Alexander, Early and Late Crawford, and Lemon Cling.
Grapes—European varieties are generally covered to be protected in winter, such as Black Hamburg, Muscat, Rose of Peru and Tokay. American varieties are: Worden, Concord, Niagara, and Delaware.
Strawberries—Clark's Seedling is the best. Practically almost any selection of the early, medium, or late varieties would give a good family supply.
Raspberries—Cuthbert, Gregg, Marlboro, and Cumberland.
Blackberries—Lawton, Elderado, and Kittatinny.
Currants—Cherry, Fay, and White Grape.
Gooseberries—Red Jacket, Champion, and Industry.

For the lower elevations of Union, Baker, and Wallowa counties the following varieties are found to do best:

Apples—Yellow Transparent, Gravenstein, King, Jonathan, Rome Beauty, York Imperial, Gano, Ben Davis, and Hyde-King.
Pears—Bartlett, Clapps Favorite, and Anjou.
Cherries—Lambert and Bing for sweet cherries; for sour cherries, Early Richmond and Olivette.
Prunes and plums—Italian and Hungarian.
Peaches—Any of the early varieties, such as Early Crawfords, Hales Early, Alexander, etc.
Grapes—Worden, Concord, Niagara, and Breighten.
Strawberries—Clark's Seedling, Sharpless, and Magoon.
Currants—Fay, White Grape.
Gooseberries—Industry, Red Jacket, and Champion.

The higher elevation of Eastern Oregon counties suffer more or less from severity of winter and drouth in summer:

Apples—The Russian varieties will be hardiest. These varieties in low altitudes are summer and fall varieties, but often in the high altitudes they are long keepers. Red Astrachan, Gravenstein, Duchess, Wolf River, Wagener, and Mackintosh Red are the best and most satisfactory to plant. Occasionally nearly any of the standard varieties grow sufficiently well for family use.
Pears—White Doyanne, Seckle, Clapp's Favorite.
Peaches—As a rule should not be grown. Occasionally such varieties as Alexander and Amsden June do very well. The Gibbs Apricot is often successful.
Cherries—Lambert and Bing for sweet, and Early Richmond and Olivet for sour cherries.
Raspberries—Cuthbert and Turners Red.
Blackberries—Any of the standard varieties such as Kittatinny, Lawton, and Elderado.
Gooseberries—Red Jacket and Champion.
Strawberries—Clark's Seedling, Warfield, and Bederwood.

PRUNING.

Pruning should start at the time of planting. The first thing to remember is to head the trees low—apples from 18 to 25 inches, pears 15 to 18 inches, peaches from 9 to 15 inches, cherries from 15 to 18 inches. All pruning should be done in the spring after the severity of

winter is over. During the second year the young trees need considerable cutting back. Where much growth results I choose from three to five branches, removing all the remainder and cutting these back to stubs from eight to ten inches in length. On the three-year-old one allow two or three branches to remain on these body branches and cut them back in turn as the previous year. From now the main thing is largely heading back growth that is more than 20 inches in length and thinning out excessive wood growth in centers. Try to encourage the tree to make a spreading growth; this can be obtained by cutting to outside buds. Where large branches are removed from trees, cut then as close to the main branches as possible, never leaving stubs. Paint over all large wounds. Where mature trees need considerable pruning take from two to three years to get them in shape. If you over-prune these mature trees you will get a great crop of water sprouts.

HANDLING SOIL.

Where the rainfall is 12 inches or greater or abundant irrigation water is to be had the problem of handling the soil becomes fairly easy. Good and thorough preparation should be given in the spring and frequent cultivation should be given in the summer in order that the

Cleft grafting. No. 1, scion inserted ready for waxing. No. 2, end view of No. 1 to show position of scion. No. 3, No. 1 waxed. Be sure to thoroughly cover the wound. All things considered, the best method of top-working.

ground will not bake or crack. The summer cultivation is shallow, the idea being to form a dust blanket which keeps the moisture from evaporating from the ground. In regions of low rainfall the problem of retaining moisture becomes quite serious at times. Every precaution must be taken to save moisture. Mulching the trees with well-rotted

manure is at times very effective. Do not pile this in great heaps around the trunk of the tree, however. One system that I could recommend for dealing with orchards that have made several years' growth would be to put on several inches of well-rotted manure and cover this with a foot or more of well-rotted straw, add a little straw every year until a well-rotted mulch a foot deep is formed. This will be found very effective in holding moisture.

BUDDING AND GRAFTING.

By budding and grafting we can grow several varieties on a single tree. Young trees or shoots can be worked over easily by budding. When the bark slips slightly, about August, make a T-shaped cut through the bark, lift the bark from either side of the vertical cut, procure a bud from the axil of the leaf and slip this bud down through

Grafting chisel. This can be made out of an old file. The blade must not be driven into the stock too far.

the vertical cut and then pull over the flaps and tie with yarn or coarse twine. In about ten days if the bud has taken hold the string should be cut away. In the spring cut out the shoot just above the bud. For the ordinary top-working the Cleft Graft will be found quite satisfactory. This is illustrated in figures two, three, and four. Wax should be used for this system of graft. Four pounds of resin, two pounds of beeswax, one pound of tallow; heat over a stove until they are thoroughly melted. Cleft grafting is generally done in the spring, preferably before growth starts.

SPRAYING.

Every man owning a home orchard should prepare himself with a good double-action brass-lined hand pump.

The codling moth will be one of the principal pests to fight. Use two pounds of arsenate of lead to 50 gallons of water. Spray just as the petals fall. The second spraying should be done about the first of August or at the time when the second brood appears. San Jose scale can be easily handled with the lime-sulphur spray—50 pounds of lime and 50 pounds of sulphur to 150 gallons of water. The lime and sulphur should be boiled in a few gallons of water until thorough blending is obtained and no free sulphur is found floating on the

A stock of this size cannot support two scions. One would have made a strong union.

water. Plant lice are sometimes very often to be found on young trees, but they can easily be controlled by using black leaf sheep dip, diluted 75 to 100 parts water.

WINTER PROTECTION.

Occasionally the cold is so extreme in parts of Eastern Oregon that the young trees, small fruits, etc., are badly winter killed. The greatest damage results from what we know as dry cold, when there is very little moisture either in the air or soil. When a good blanket of snow is on the ground the trees have been known to withstand very low temperature, but with dry bare ground, especially if this is light in character, the damage becomes very serious. Cover all ground

around young trees with six inches or more of straw. It would be very well to tie some straw up around the trunk of the tree also. Leave this on until all danger is over, removing in the early spring.

Blackberries can easily be laid down by digging along one side of the tree and bending the canes to the ground and covering with straw. Cover strawberry plants with about three inches of straw. Be sure to remove this in the spring before the new growth starts. If left on too long the plants will force out and may be so tender that they are nipped by the spring frosts. Occasionally where the straw is put around young trees one must watch for the mice. The greatest winter killing comes during the first two or three years, as a general rule.

Result of two scions on a small stock. The stock is decayed in the center. Practically lost. One scion would have prevented this.

Wayne of Glencoe, Holstein cow, owned by Oregon Agricultural College. Record in twelve months, 16,850 pounds milk, containing 547.18 pounds fat, equivalent to 638.38 pounds butter (estimated).

BETTER COWS.

F. L. KENT
Department of Dairy Husbandry.

In discussing the question of dairy production frequent reference is made to the fact that the latest United States census reports show that the average annual butter production per cow is about 140 pounds. The report of the Iowa Dairy Commissioner shows that the average annual butter production per cow furnishing milk to the Iowa creameries is about 130 pounds.

The Illinois Experiment Station in its work of testing dairy herds in various parts of the State, has secured yearly records of 554 cows in 36 herds. To secure a comparison of a large number of these animals we may take the one-fourth, 139 cows, comprising the lowest producers, and the one-fourth, 139 cows, comprising the highest producers. The former averaged 133 pounds of butter fat, equal to 155 pounds of butter, and the latter produced 301 pounds of butter fat, equal to 351 pounds of butter. The average for the entire number was about 200 pounds of fat, equal to 233 pounds of butter.

The average price for butter fat in Illinois for the time covered by these records, was 23 cents per pound. At this price the 139 poorer cows made an average return for butter fat of $30.77 per cow. If the cost of the feed be estimated as low as $30 per year, there would result a profit of 77 cents per cow per year.

But the 139 best cows made an average income for butter fat of $69.23. Allowing these cows $38 per head for feed, the profit is $31.23 per cow per year.

From the standpoint of relative profit realized, one of the better cows would produce as much as 41 of those in the poorest group. One of the poorer cows would have to be milked 4½ days to produce a profit of one cent, and would have to be milked 45 times to produce a profit of five cents. In these computations, as is the general practice, it has been assumed that the value of the calf, the skim milk, and the manure would offset the cost of caring for the cow.

It is safe to presume that the average of these cows is considerably above the average for the whole State, because the farmer who takes sufficient interest in his dairy herd to have them tested will generally have a herd much above the average.

In the State of Illinois there are approximately 1,000,000 cows, yet out of this number the Experiment Station has been able to secure data covering a full year for but 554 animals owned in 36 herds, and this required three or four years' time. This is not because the station has not been able and willing to do the work of testing, but because the farmers did not care to send in their samples, even though the only expense attached was the express on the samples and a little extra work required in weighing the milk and taking the samples.

The Oregon Experiment Station at Corvallis, early last November, published the statement in several of the leading agricultural papers of the State, that it would test dairy herds on the plan outlined above. So far *two* dairymen have accepted the offer and are sending in their samples monthly for testing. In addition to these there are three herds in the western part of the State which are visited monthly by a representative of the station, for the purpose of making official tests for two-day periods to determine whether the animals tested are eligible to the Register of Merit of the American Jersey Cattle Club. The requirements for entry into this Register of Merit provide the production of butter fat in 12 consecutive months as follows: If the cow calves under two and one-half years of age, she must produce 260 pounds of butter fat; between two and one-half and four years, 300 pounds; between four and five years, 350 pounds; and if over five years of age, she must produce in the 12 months, 400 pounds.

The records which have been secured in various states, and the difficulty experienced in getting them, would seem to indicate that there is perhaps an even greater proportion of poor dairymen than of poor dairy cows. There is no doubt that a large proportion of the 139 poor Illinois cows, would have produced a much larger margin of profit had they been given proper care and feeding. A number of instances might be cited to show that a change in ownership and methods of handling a dairy herd has made a very marked difference in the profit yielded. But there are many cows that do not have the ability to convert food into milk and butter fat. As one of the many cases that might be mentioned is that of two cows designated as No. 1 and No. 3, owned by the Illinois Station. These two cows were raised alike in a herd of one hundred in the Elgin district, and at the Experiment Station were both cared for in the same way and given the same kind of feed and encouraged to eat all they could make good use of. But the results obtained were widely different. The records were kept for three years, cow No. 1 showing an average annual production of 11,300 pounds of milk containing 405 pounds of fat, and a clear profit over cost of feed of $34.51, while cow No. 3 gave annually only 3,830 pounds of milk containing 138 pounds of fat, produced at a net loss of $5.62.

This is a striking illustration of the value of using the scales and the Babcock test to determine what each cow in the dairy herd is

doing, and the cow owner who does not possess himself of this information must be classed as a poor dairyman.

"What's the use of all this talk about the poor cow when one can't buy good ones?" some one will say. In the first place, as has been indicated, considerable can be done along the line of better care and feeding. There are too many cow owners like the one we came across in one of the newer sections of the State recently. A creamery had just been established near by, and this dairyman (?) expressed himself to us about as follows: "I believe this creamery business is a good thing. When I finish my hay harvest I am going to get a bunch of cows up from the woods, take the calves away from them, and produce milk for ————'s creamery." It is a safe guess that this man soon decided that "dairying don't pay."

Lady King, Ayrshire cow, owned by Oregon Agricultural College. Record in twelve months, 11,678 pounds milk, containing 466.69 pounds fat, equivalent to 544.47 pounds butter (estimated).

In this section of the country there are many opportunities for the growing of alfalfa, which is the best single plant the dairyman can grow. A well balanced ration for a dairy cow can be made up from alfalfa hay and rolled barley, although some succulent food in addition, such as silage or roots (mangels, carrots, sugar beets, etc.), would give better results. The following is suggested as a suitable ration for a cow weighing 1000 pounds and giving 25 pounds (three gallons) of milk daily, testing four per cent butter fat:

Alfalfa hay	20 pounds
Rolled barley	4 pounds
Stock beets (mangels), or silage	20 pounds

If only alfalfa hay and barley are available increase the amount of hay to 25 pounds.

But the real improvement in the dairy herd will be accomplished through better breeding. It is a common expression that, "the sire is half of the herd," and this is particularly true with the dairy herd. The Babcock test and the milk scales will indicate which are the best cows in the herd, and if these are bred to a sire whose female ancestry has good records as milk and butter producers there is no question but that material improvement will result. The practice of getting a grade bull from a neighbor's herd because he can be secured cheaply is the poorest kind of dairy economy. One breeder who tested his cows and kept careful records of them reports that by the use of a pure-bred bull, purchased as a calf for $50.00, he secured heifers that in their first period of lactation, gave practically as much milk as their mothers, and the milk contained twenty-five per cent more butter fat. Occasionally a buyer can secure mature cows that have proven their worth as producers, but the great majority of breeders must depend upon their own herds for the development of the cow that is to produce them butter fat to the value of $100.00 or more annually.

At the present prices for dairy products no wide awake dairyman should be satisfied unless he has some cows in his herd that will produce an annual income for butter fat of $100.00 or more. The Ladd cow, Adelaide of Beechlands, owned at Portland Oregon, at one time a Jersey champion, produced in twelve months 849.62 pounds of butter fat, worth at current prices for that year, $271.88, and this production was accomplished at a food cost of $52.88, leaving a net profit of $219.00. In speaking of this cow at the close of the test Mr. Ladd wrote: "The cow is in fine physical condition and has no appearance of being forced, as in truth, she was not. She is also entitled to credit for the added burden of carrying a calf for over one half of the time of the year's test."

The Domes herd at McCoy, has also shown some wonderful producers during the progress of the register of merit tests. This is a practical working herd, owned by a hard working German farmer, and his wide awake son, a young fellow not yet twenty-one years of age. In fact, the young man has had practically a free rein in the development of the herd, and the nature of his results is shown in the record of his herd up to January 31, 1910, as follows:

Milk and butter fat production, herd of A. F. & W. J. Domes, authenticated by Oregon Experiment Station.

Registry No. of cow	Number months	Pounds milk	Pounds fat	Value fat
205,101	12	12,343	816.36	$ 268 54
205,097	12	8,883	639.30	213 35
213,585	11	8,889	489.25	160 68
205,098	11	9,100	475.96	157 09
205,094	12	9,593	474.21	156 35
210,518	12	9,355	463.46	156 50
210,518	12	9,258	461.88	153 12
190,633	12	9,171	452.57	149 04
172,671	12	8,631	379.02	129 24
179,363	9	8,188	365.31	119 34
205,096	10	7,790	364.29	116 26
214,617	10	6,518	358.19	113 16
205,100	10	5,288	344.72	110 55
195,733	10	5,825	321.32	104 38
196,402	10	6,203	325.55	104 87
205,102	8	5,981	323.26	109 45
213,586	8	4,976	271.10	91 63
214,150	7	4,957	258.44	91 41
213,587	7	5,244	258.31	91 09
213,590	6	3,808	197.28	72 89

The twenty cows the records of which are given in the foregoing table, comprise all of the cows in milk in this herd with the exception

of four or five which the owner did not care to put on test. Of the fifteen animals tested for a period of nine months or longer, all except one met the high requirements for entry into the American Jersey Cattle Club Register of Merit, and the record of the cow at the head of the list is the highest known record for a Jersey calving under the age of two and one half years. This animal dropped her calf immediately preceding her test at the age of two years and five months.

The average production for the fifteen cows milking nine months or longer is as follows; milk, 8,336 pounds; butter fat, 448.76 pounds; value of butter fat, $147.49. If the average be confined to the nine having a record for eleven and twelve months the results will be as follows: Milk, 9,469 pounds; butter fat, 516.89 pounds; value of butter fat, $171.55.

This herd was kept under very ordinary farm conditions. The dairy barn was just an old farm barn remodeled to the extent of putting in swinging stanchions and gutters. No heavy grain feeding was practiced, the cow producing the highest record receiving at no time more than nine pounds of grain feed daily. The roughage for the herd consisted mainly of clover hay and kale for winter, and clover pasture for summer. Thus it will be seen that the conditions were just such as might be found on any fairly well managed farm. A part of the success with this herd may be attributed to the absence of hired help about the dairy barn. Practically all of the milking was done by the young herdsman with the assistance of his father and mother.

POULTRY ON THE FARM.

BY JAMES DRYDEN,
Department of Poultry Husbandry.

Poultry keeping may be made a leading feature of a system of mixed farming. As a part of a system of mixed husbandry, it will pay a larger profit than as a separate business. It is the general farms that the country depends upon for the large part of the poultry and eggs consumed. A large proportion of the poultry products in the United States, which amount to over $600,000,000 a year, are produced in the middle west states where mixed husbandry prevails. The three States of Iowa, Illinois and Missouri produce over one hundred million dollars worth of poultry products per annum. Nebraska and Kansas furnish Oregon with half a million dollars worth of poultry and eggs a year. In certain sections the farmers of Oregon are eating storage eggs imported from those states.

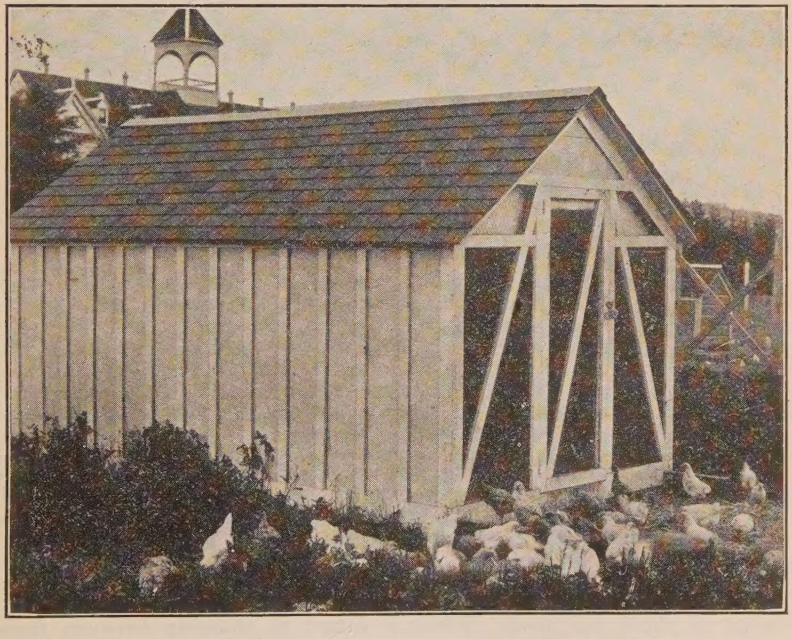
If farmers in Oregon would keep on an average 100 good hens and give them good care, it would add two or three million dollars to the value of the poultry products of the State. It is not necessary to go into the business on a large scale, nor is it necessary to neglect any thing else on the farm in order to do this.

There are farms where poultry might profitably be made the leading feature of the farm without in any way interfering with a general rotation of crops. In other words, there are farms producing grain, fruit, and dairy products on which poultry keeping may be made a profitable business without any charge or cost for land. Where wheat and clover and fruit will do well poultry will do well. Whether it would pay to make poultry keeping the leading feature of the farm would depend upon the special fitness of the farm for poultry and upon market conditions.

Locations for Poultry Keeping. Certain soils are more adapted than others to successful poultry keeping. If possible, heavy clay soils should be avoided. A light, porous soil is preferable. This is drier in wet weather and not as hard in dry weather as a heavy clay

soil. A wet soil is colder than a dry one. The ground should have good natural drainage. Water should not be allowed to stand in the chicken yards. Muddy feet mean muddy eggs. Dampness means roup, catarrh, rheumatism, tuberculosis, etc. Soil conditions are important. Air conditions are equally important. Poultry houses should not be located on low damp ground where cold air is stagnant, nor should they be located on hills exposed to high winds. Cold stagnant air and high winds are unfavorable to high egg production. Poultry houses should be built where they will get the benefit of the sunshine. At the same time, shade is very necessary for fowls of all ages in the summer time. Other things being equal, a location near a good shipping point should be given the preference.

KIND OF HOUSE TO BUILD. Fowls may be kept very successfully in different styles of houses, but certain principles should govern in building any kind of house. *Ventilation.* Fowls require considerably more fresh air than farm animals. It has been estimated that a hen in proportion to her weight requires double the weight of oxygen that a man or a horse requires. Ventilation keeps the house dry. A close, warmly built house, with glass windows, is always damp. Ventilation can best be furnished by leaving one end or one side of the house open or partly open. *Protection from Storms.* A little shelter from the winds and the storms will add to the comfort of the fowls and therefore to the egg yield. While affording protection from storms the house should also furnish scratching room, for activity is the life of the hen. It will pay to provide cheap straw sheds or scratching room where snow or storms keep the fowls indoors much of the time.



A portable colony house at the Oregon Agricultural College.

THE PORTABLE COLONY HOUSE. Much of the trouble from diseases comes from keeping the chickens on the same ground year after year.

With a portable house it is possible to keep them on clean ground by moving the house occasionally. Second, the portable house system fits in with a system of crop rotation on the farm. About fifty chickens per acre will keep the land in good fertility. Third, the work of feeding and caring for the fowls is simplified by the colony system. The chickens will find a considerable portion of their feed in the waste grain and weed seeds, grasshoppers and other insects. They may sometimes save valuable crops by ridding the farm of grasshoppers. Another important advantage of the colony system is that the fowls are more active when they have the liberty of fresh fields than when confined in yards; and fourth, there is no expense for fencing when the colony free range system is used.

A good size of portable house is seven feet by twelve feet. A team of horses will pull a house of this size, and it will accomodate from 30 to 50 fowls. This house may be built at a cost of from $15 to $20 for material. Details of construction will be furnished on application.

YARDING THE FOWLS. Where the fowls have to be yarded, the best plan is to have double yards, or two yards for each pen of fowls. By cultivating and cropping the vacant yards the ground will be kept cleaner and the danger from diseases lessened. Green food for the fowls may be grown on the yards, or vegetables may be grown for the family. Such crops as vetch, clover, kale, alfalfa, rye, etc., may be grown.

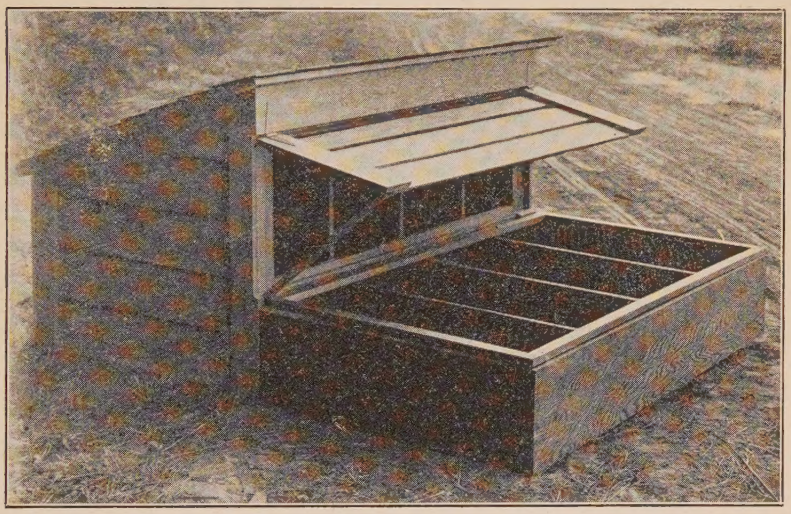
Two types of fowls. The one on the right lacks vigor and market qualities, as well as beauty.

THE FARM FOWLS. On the general farm, the fowl that pays the best profit is the "triple purpose" fowl. It doesn't matter so much what the breed is, but the farm fowl should be a good layer, a good producer of meat, and a good sitter. She should be a good producer of eggs and meat and a good reproducer of her kind. The Plymouth Rock of three varieties, the Wyandottes of eight varieties, the Rhode Island Reds of one variety, and others, are good; that is, individuals or strains of them are good. When it comes to choosing between these breeds and varieties, it is more a question of individuals than of breeds. There are good and poor layers in all breeds. Select fowls, if possible, that are known to be good layers, and in any event select those that

have good health and vigor. If fowls cannot be found that meet these conditions, then farm fowls of mixed breed may be used, mating them each year with pure bred males. In four or five years by this process of grading the farmer may have a flock of fowls that are of uniform shape and color that will give profitable returns.

RAISING THE CHICKENS. More important than the breed is the vitality of the stock. Do not always blame the breed for a poor egg yield. It is not so much a question of "making the hens lay" in winter, as it is a question of "making the hen." The hen must be made right. Improper raising is very often the cause of the empty egg basket.

If a proper system be followed chickens may be conveniently and successfully raised in large numbers by using hens for hatching and brooding. Two methods may be used. By the first method the sitters



A combination hen-hatching, brooding, and colony coop in use at the Oregon Experiment Station.

must be let off the nests once a day. The hens are set in rows of nests, two or three tiers high, built along the side of the wall in some unused house or shed. When the chicks hatch they are put in coops to brood and raise. By another method the hens are set in a coop about three feet by five feet, which is large enough for four sitting hens. ((See illustration.) Each hen has a separate run and leaves the nest and returns at will. By keeping feed and water before the hens all the time, little labor is required by the attendant. The house is large enough to raise the chickens in, two of the hens taking care of the chicks raised by four.

A bulletin giving a fuller description of these houses and methods will be furnished on application.